# Notes on the natural history of the Tussock Skink *Pseudemoia pagenstecheri* from basalt plains grasslands near Melbourne

Grant S Turner

103 Settlement Road, Bundoora, Victoria 3083.

**Abstract**

Field data and observations on the natural history of the Tussock Skink *Pseudemoia pagenstecheri* inhabiting the basalt plains grasslands near Melbourne are described based on the capture of 141 of these lizards and approximately 70 sightings. Mature females were larger and heavier than males and the adult sex ratio was 1:1. There was a strong linear correlation between snout-to-vent length (SVL) and both tail length and head length; the natural logarithm of both SVL and mass were also strongly correlated. Skinks were active in all months of the year when conditions were favourable and they used primarily stones and grass tussocks as both refugia and basking sites. They tended to occur singly, both when active and sheltering. Parturition occurred in December and January. Small elapid snakes were found to prey on *P. pagenstecheri* of all sizes. (*The Victorian Naturalist* **129**(2), 2012, 46–53)

**Keywords:** Tussock Skink, basalt plains, size, activity, behaviour

## Introduction

The Tussock Skink *Pseudemoia pagenstecheri* is a small, terrestrial, diurnal lizard confined to the southeastern corner of mainland Australia and Tasmania (Hutchinson and Donnellan 1992; Bennett 1997; Hutchinson *et al.* 2001). *Pseudemoia pagenstecheri* is a very common inhabitant of the basalt plains grasslands to the north and west of Melbourne and this area forms one of five disjunct regions comprising the species' distribution (Hutchinson and Donnellan 1992; Larwill 1995). The life history of *P. pagenstecheri* has been the subject of several studies (Ward 1978; Hudson 1988, 1997) and the species reproductive mode has also been examined (Thompson and Stewart 1994). In the course of doing reptile surveys of Werribee-Keilor grassland plains near Melbourne, data and observations were collected on the size, appearance, habitat use and behavior of *P. pagenstecheri* and this, along with captive observations of the species, are detailed below.

## Methods

Four remnant basalt plains grasslands within 25 km of the Melbourne CBD were regularly visited between 1991 and 1994. Grasslands were located at Craigieburn, Deer Park, Bundoora and Altona; only fragments of the latter three now exist due to the expansion of housing and industrial developments. Lizards were located by visual inspection of potential basking sites and by searching beneath ground cover (grass tussocks and surface stones) during daylight hours; capture was by hand. Capture rates were not equal throughout the year: they were greatest when lizards were inactive, and variable in other months. Size variables recorded from captured lizards were: snout-to-vent length (SVL, ± 1 mm), tail length (TL, ± 1 mm) and tail condition (original/incomplete/regenerated), mass (M, ± 0.01 g) and (in about 30% of lizards) head length (HL, ± 0.1 mm; as measured from the tip of the snout to the distal point of the parietal scale along the midline). Other data recorded included reproductive status (i.e., gravid/not gravid, post-parturient; see below), activity (i.e., basking, active or secluded) and general condition of skinks. The sex of adult lizards was inferred from existing secondary sexual characters, notably the presence/absence of an orange-red mid-lateral stripe in mature male skinks. In populations west of Melbourne the stripe is present throughout the year, although it is more vivid during late summer to early winter (Hutchinson and Donnellan 1992). Swelling of the tail base (indicative of swollen hemipenes — paired copulatory organs) was also used to confirm the sex of adult males as was eversion of the hemipenes in some instances. The abdominal region of females was palpated to establish if they were gravid or post-parturient;

heavily gravid females were easily identified by their general 'bloated' appearance. Males were deemed sexually mature (i.e., adult) if SVL ≥ 39 mm and females if SVL ≥ 40 mm, based on data in Hutchinson and Donnellan (1992). Faecal samples from some potential predators were collected and examined for the presence of skink scales.

Eight *P. pagenstecheri* (comprising four males and four females) were kept in captivity where they were housed together in a glass aquarium on a gravel substrate with dry grass tussocks, several stones for refugia and a small water bowl. They were fed on a diet of live food, mainly chopped earthworms, mealworms and small crickets when available. The females each produced young and were housed separately from the males until parturition in order to gather data on relative clutch mass, neonate size and appearance. The enclosures received sunlight from a north-facing window.

### *Data analysis*

Statistical analysis of data was performed using SPSS (V.11) and MS Excel (2007). Morphometric variables were either normally distributed or natural-log transformed in order to satisfy the assumptions of the parametric statistical tests employed (Student *t*-test, ANCOVA, ordinary least squares regression and correlation). Coefficients in regression equations are quoted with standard errors. Frequencies were compared by means of one and two-way tables using the $\chi^2$ statistic with Yate's correction for continuity applied (Sokal and Rohlf 1995). Gravid and post-parturient females and individuals with incomplete tails were excluded from analyses involving mass. Two measures of relative clutch mass were calculated: RCM1 — the difference between the female's mass immediately before and after birth, divided by her mass after birth: and RCM2 — the total mass of neonates divided by the female's mass immediately after birth.

## Results

A total of 141 Tussock Skinks were captured. Approximately 70 more eluded capture but were observed from a distance.

### *Size, growth and appearance*

Mature females were significantly larger than mature males: mean female SVL was 57.4 mm (n = 53) and mean male SVL was 52.9 mm (n = 54; $t$ = 3.760, 98 df, $P$ = 0.0003). The mean adult female and male mass was 2.48 g (n = 19) and 2.41 g (n = 30) respectively. These were not significantly different ($t$ = 0.259, 30 df, $P$ = 0.798, but see below). The largest female SVL was 69 mm and the heaviest non-gravid female weighed 4.06 g (with an incomplete tail) and was located in mid-winter. The heaviest individual was a gravid female weighing 5.78 g. The largest and heaviest male had a SVL of 62 mm and weighed 3.43 g and was located in mid-winter. The lightest adult female and male were 0.82 g and 0.70 g respectively. The smallest skink (a neonate) was located in December and had a SVL of 22 mm. The mean dimensions of neonates from four captive-born litters were: SVL 22.8 mm, TL 29.3 mm and weight 0.19 g (Table 1).

Mass and SVL were highly correlated within each sex (Fig. 1; males: $\ln M = (2.73 \pm 0.151) \ln SVL - (9.89 \pm 0.593)$, $r^2 = 0.915$, $P < 0.0001$, n = 31; females: $\ln M = (2.65 \pm 0.146) \ln SVL - (9.67 \pm 0.578)$, $r^2 = 0.952$, $P < 0.0001$, n = 19). Males and females differed significantly in mass when SVL was controlled for (ANCOVA: $F_{1,75}$ = 15.505, $P$ = 0.0002; Figure 1 slopes $t$ = 0.38, 45 df, $P$ = 0.703; intercepts $t$ = 2.81, 46 df, $P$ = 0.0073). The slope of the regression line

**Table 1.** Data from four litters of Tussock Skinks *Pseudemoia pagenstecheri*. The two measures of relative clutch mass RCM1/2, the mean snout-to-vent length SVL, tail length TL and mass are given for each litter.

| Female SVL (mm) | Date of Birth | Litter Size | RCM1/2 | SVL (mm) | TL (mm) | Mass (g) |
|---|---|---|---|---|---|---|
| 57 | 25 Jan. | 5 | – | 23.0 | 25.8 | 0.18 |
| 57 | 23 Dec. | 6 | 1.28/0.62 | 22.2 | 30.8 | 0.16 |
| 55 | 30 Dec. | 4 | 0.89/0.44 | 23.9 | 31.3 | 0.20 |
| 65 | 31 Dec. | 6 | 0.65/0.40 | 22.2 | 29.5 | 0.21 |

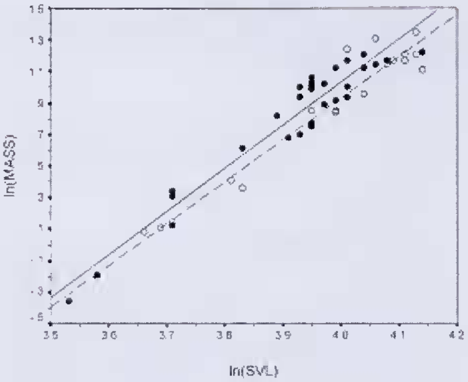


**Fig. 1.** The natural logarithm of SVL versus the natural logarithm of mass in Tussock Skinks *Pseudemoia pagenstecheri*. Regression lines are given for males (solid circles, solid line) and females (open circles, broken line).

differed marginally from the expected value (3) in females ($t = 2.43$, 19 df, $P = 0.026$) but not in males ($t = 1.78$, 31 df, $P = 0.085$).

In all individuals with original tails, TL exceeded SVL and there was a strong linear relationship between these two variables described by the regression equation: TL = (1.411 ± 0.151) SVL + (2.804 ± 0.593) ($r^2 = 0.755$, $P < 0.0001$, n = 53). The number of Tussock Skinks with original tails did not differ between the sexes (34% females, 42% males; $\chi^2 = 0.38$, 1 df, $P = 0.537$). The longest (original) TL was 95 mm from a male with a SVL of 57 mm. In juveniles and subadults the proportion of individuals with original tails was significantly higher than in adults (80% juveniles, 38% adults $\chi^2 = 19.47$, 1 df, $P < 0.0001$). There was also a strong linear relationship between SVL and HL described by the regression equation: HL = (0.084 ± 0.005) SVL + (3.177 ± 0.275) ($r^2 = 0.822$, $P < 0.0001$, n = 36).

Adult *P. pagenstecheri* comprised 74% of all skinks caught and 61% of all those observed. The monthly distribution of SVLs (Fig. 2) indicated apparent variation in the size structure of populations (or at least the sample) throughout the year. In December and January the greatest range in SVL (approx. 40 mm) occurred due to the presence of the neonate cohort, while in the winter months the detected SVL range was less (approx. 30 mm), presumably due to the growth of this cohort. The distribution also suggests that maturity, in some individuals, is attained by about 12 months of age since the smallest skinks recorded in January and December had SVLs > 40 mm. The sex ratio of the adults was 1: 1 (55 males and 55 females).

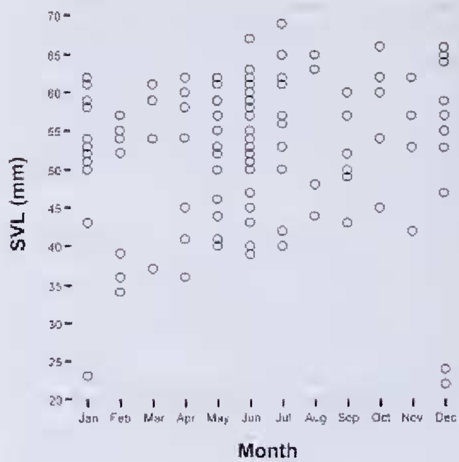


**Fig. 2.** Monthly distribution of SVLs (in mm) in the Tussock Skink *Pseudemoia pagenstecheri* (n = 111). Note that identical data points are not distinguishable in the plot.

The frequency of sloughing (shedding of old dead skin) in adults could not be reliably determined due to the small sample size. No skinks (adult or juvenile) were observed sloughing in winter; two adults were sloughing in April (while in another adult sloughing was imminent at this time) and one adult in early May. Two juveniles were sloughing in February.

The presence of black patches on the rear limbs was noted in adult males and has not been mentioned previously in general descriptions of the species. Black patches occurred on the posterior surface of the femoral and tibial regions of the rear limbs (Fig. 3). Patches typically extended unbroken from the rear limb-body junction down to the base of the foot. Patches were sharply demarcated from the dorsal ground colour. Most males (83%; 45 of 54) captured during the period April to September (inclusive) had distinct black patches on the rear limbs, and approximately half had swollen hemipenes (n = 23); of nine males captured in February two had distinct black patches but in the remainder black patches were present but

**Fig. 3.** Black patches (indicated by arrows) on the rear limbs of an adult male Tussock Skink *Pseudemoia pagenstecheri.*

faint. This may indicate seasonal variability in the intensity of the black patches, and is supported by the apparent fading of black patches in three adult captive males. Only one female (2%; 1 of 53) had faint black patches. Black patches were not observed in any juveniles. In six small males (SVL 35 – 40 mm), three had developed black patches and had swollen hemipenes while the remainder exhibited neither attribute. The smallest male with black patches had a SVL of 37 mm. Given the occurrence of black patches predominantly (or perhaps exclusively) in males they may represent another form of sexual dichromatism.

***Reproduction***

Heavily gravid females were recorded in November (n = 6) and December (n = 5). In addition, a female accidentally killed on the 21st November was found to be gravid with eight mid-term embryos (see below). Post-parturient females were recorded in late December through to late January (n = 6). Neonates were observed in the field during late December (n = 9) and throughout January (n = 6). This was consistent with the timing of parturition in captive females (Table 1). Parturition (giving birth) was not witnessed in captive skinks but did occur during daylight hours (see also Hudson 1999). Litter size in four females ranged from four to six (Table 1).

A two-fold difference in each measure of RCM (relative clutch mass) was found (cf. Female 2 and 4, Table 1). A comparison of the two relative clutch mass measures also exhibit a two-fold difference, indicating that a significant loss of fluids and fetal material occurs at birth, and is virtually the same as the combined mass of the neonates in the litter (see Hudson 1999).

In six females, pitting and minor scale damage on the upper flank ('shoulder' region) was evident and two females located in May had fresh abrasions around the neck and upper flanks; the timing and occurrence of these minor injuries are consistent with 'grip' bites applied by male skinks when attempting to mate (Hutchinson and Donnellan 1992). Neither courtship nor mating was observed.

***Diet and predators***

Four field observations were noted of skinks attempting to feed on dipterans (flies) (n = 2), a small Black Field Cricket *Teleogryllus commodus* (n = 1) and a small caterpillar (n = 1).

The remainder of data on the diet of *P. pagenstecheri* was obtained from faecal pellets collected from 14 adults. These contained a variety of insect fragments, including small unidentified coleopterans (beetles) and dipterans (flies).

Faecal samples and regurgitated food items from both adult and juvenile Little Whip Snakes *Parasuta flagellum* (n = 32), juvenile Eastern Brown Snakes *Pseudonaja textilis* (n = 15) and juvenile Lowland Copperheads *Austrelaps superbus* (n = 3) indicate that these snakes are all predators of *Pseudomoia pagenstecheri*. Numerous *P. pagenstecheri* scales were found in the samples. Regurgitated Tussock Skinks (n = 14) ranged in size from neonates to adults. Three dead and partially consumed *P. pagenstecheri* were located beneath stones occupied by large scolopendrid centipedes; in one instance a centipede was observed feeding on a dead skink.

***Refugia, habitat use and activity***

Sheltering *P. pagenstecheri* were predominantly located beneath surface stones and in the grassy ground layer (especially the base of tussocks). They were also found beneath fallen limbs of the River Red Gum *Eucalyptus camaldulensis* (in northern grasslands) and other ground debris (e.g. linoleum, corrugated iron, cardboard, etc.).

*Pseudemoia pagenstecheri* were most common in grassland habitats that had a relatively open, grassy, ground-layer. Fewer *P. pagenstecheri* were detected in dense stands of ungrazed and infrequently burned Kangaroo Grass *Themeda triandra* than those with some grazing and/or more frequent (mosaic) burning. Lizards were uncommon in heavily grazed grasslands, even if surface stone was common. The floristic composition of grasslands where *P. pagenstecheri* occurred seemed less important than the presence of a grassy ground layer, since these skinks were found to be reasonably common in several grassland remnants that consisted predominantly of exotic grasses and herbs.

*Pseudemoia pagenstecheri* appeared to exploit suitable conditions for activity throughout the year. Individuals were observed either basking or active in all months. Only in winter were they inactive for extended periods; however, on sunny winter days lizards would emerge from cover to bask. Even when inactive beneath stones during winter they were still capable of quite rapid movement when disturbed. In cool weather during summer months, lizards sheltered beneath stones and amongst grass tussocks by day. On being disturbed when active, skinks would typically retreat into the grassy ground layer or beneath stones; on several occasions skinks sought refuge down cracks in clay soil.

Only on three occasions were multiple *P. pagenstecheri* found together beneath the same stone. On each of these occasions two skinks were present (an adult and juvenile; two females; an adult male and female), and they were well separated (> 0.15 m). On five occasions *P. pagenstecheri* were located with one or more Garden Skinks *Lampropholis guichenoti* beneath the same stone, but not in direct contact. During winter they were found cohabiting with known predators: *Parasuta flagellum* (n = 2) and juvenile *Pseudonaja textilis* (n = 1). They were also recorded beneath the same stones as Spotted Marsh Frogs *Limnodynastes tasmaniensis* (n = 5) and Growling Grass Frogs *Litoria raniformis* (n = 2).

Though primarily ground-dwelling in habit, adult *P. pagenstecheri* were often (n > 15) observed perched on the blades and peduncles of Kangaroo Grass tussocks in the field, particularly on overcast or cool sunny days. The heights at which lizards were perched did not exceed 0.6 m. Perching was commonly observed in dense (un-burnt) stands of Kangaroo Grass where little or no sun-light reached ground level. When approached, these lizards would quickly alight into the grassy ground-layer. They were also regularly observed basking on top of stones.

***Behaviour***

Field observations of the behaviour of *P. pagenstecheri* (besides retreating or basking) were few owing to the difficultly in approaching lizards without disturbing them. Some noteworthy observations on the behavior of captive individuals described here relate to interspecific aggression, basking posture, tail wriggling and sleeping in water.

1. The largest male (SVL 62 mm) of the captive group consistently behaved aggressively towards other adult males, approaching them usually from behind and lunging at them from a short distance, firmly grasping them

on the tail, body or head. Males subjected to these attacks would attempt to break free, but retaliation was not observed. Immediately prior to and during the attacks, smaller males exhibited slow lateral undulations of the tail. Females and a small male were ignored by the large male and did not react to the skirmishes taking place centimetres away from them. At times the large male was so preoccupied with biting that it would not release its grip even when handled. The bites were sometimes maintained for up to 30 seconds (n = 3). No apparent injuries resulted from these bites, though the large male was eventually separated from the group in order to prevent aggressive encounters.

Neonates would avoid adult skinks by seeking refuge when approached. Therefore they were moved to separate enclosures immediately after birth. A delay in the removal of neonates from one litter resulted in one neonate being consumed by its mother, and another losing its tail. When handled, some neonates commenced slow lateral undulations of the tail, sometimes followed by twisting and flipping of the body.

2. A curious basking posture was occasionally exhibited by captive skinks (n = 5) when they emerged to bask on sunny winter mornings. Within minutes of emerging, the limbs, one-by-one or occasionally in pairs, were raised clear of the substrate, fully extended and pressed flush against the body, with digits pointing towards/along the tail. This gave skinks a streamlined appearance (Fig. 4). The rear feet were usually propped up on the tail but in some skinks they were in their usual resting position but with the knees awkwardly pointing upwards. The basking posture was maintained for 5–13 minutes (n = 12), after which time the skinks became active. This same basking posture was observed in adult *P. pagenstecheri* in the field that were also basking on sunny winter days (n = 4).
3. Tail-wriggling was observed on four occasions in captive skinks in response to their being placed next to an enclosure containing several *Parasuta flagellum*. Skinks reacted by ceasing all movement except for slow lateral undulations of the tail lasting 5–10 seconds (n = 6). This was followed by a short rapid sprint away from the snake. These tail movements were very similar to those exhibited during aggressive interactions between males and in neonates when handled (see above).
4. Some captive *P. pagenstecheri* (n = 4) were observed sleeping in the water bowl, rather than on the gravel substrate or beneath ground cover in the enclosure. The skinks slept fully submerged except for the tip of the snout, and emerged each morning to bask. Observations occurred during the winter (June) when the minimum night air temperatures were slightly below 10°C.

**Discussion**

Body sizes and the timing of reproduction recorded here are in close agreement with previous studies of a *P. pagenstecheri* population from grasslands in Laverton, west of Melbourne. Adult *P. pagenstecheri* females are known to be longer than males and the SVL means and extremes (22 to 69 mm) recorded in this work correspond closely with those of previous studies (Hutchinson and Donnellan 1992; Hudson 1997). The heaviest non-gravid female found in this study was significantly heavier than previously determined (4.06 vs 3.20 g; Hudson 1997). Clutch size from the small sample in this work (4–8) was within previously determined ranges (1–14: Ward 1978, Hudson 1997) as were neonate size, mass and RCM (Hudson 1997, 1999). The significant negative allometry (proportional growth) in the SVL–mass relationship in females is possibly due to the inclusion of (under-weight) post-parturient females in the sample. The timing of parturition (December – January) and the growth rate (i.e., the attainment of adult size at 12 months of age) inferred from the monthly distribution of SVLs (Fig. 2) were both consistent with previous studies (Hudson 1997, 1999).

The significance of the black rear limb patches in adult male *P. pagenstecheri* is not obvious since, to the human eye at least, they are neither brightly coloured nor prominently located. *Pseudemoia pagenstecheri* were not observed to use their rear limbs in visual communication; however, two species of *Lampropholis* do so (Daly 1993; Torr and Shine 1994). It would be of interest to know whether the patches are conspicuous outside the visible light

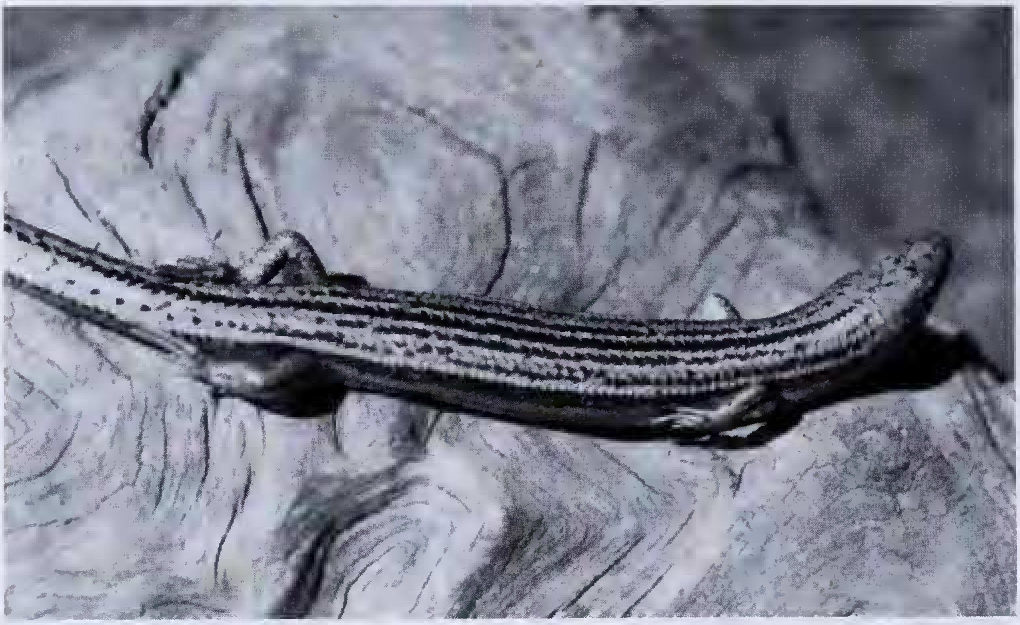

**Fig. 4.** An unusual basking posture exhibited by an adult Tussock Skink *Pseudemoia pagenstecheri*.

spectrum (e.g. in the UV spectrum) since UV visual capacity and structures with high UV reflectance are known in lizards (e.g. Fleishman *et al.* 1993; Blomberg *et al.* 2001). Alternatively, given the patches are most intense during the cooler months of the year, they may instead aid in thermoregulation rather than communication; but why they should occur mainly (or exclusively) in males is unclear. Two published photographs where the black rear limb patches are clearly shown are in Hutchinson *et al.* (2001: 35) and Swan *et al.* (2004: 181).

Several behaviours reported here have been noted previously in *P. pagenstecheri* or reported in other skink species. The climbing of grass tussocks has been observed in populations of *P. pagenstecheri* from the Australian Capital Territory (Bennett 1997) and also in the sympatric Striped Legless Lizard *Delma impar* (Turner 2007a). A basking posture very similar to that described above has been observed in the Southern Water Skink *Eulamprus tympanum* (see Fig. 31.10 in Hutchinson (1993)) and in the Mt Bartle Frere Skink *Techmarscincus jigurru* (Turner 2007b) indicating that it is likely to be widespread amongst skink genera. I have also observed overwintering Striped Skinks *Ctenotus robustus* with their rear limbs slightly adpressed with the feet resting up on the tail in a similar fashion to some basking *P. pagenstecheri*. Sleeping in water has been observed in wild Gippsland Water Dragons *Physignathus lesueurii howitti* (Turner 1999) where it was presumed to be of thermoregulatory benefit, and this might also be true in *P. pagenstecheri* although the behaviour has not been observed in the field. Infanticide by a female *P. pagenstecheri* has been recorded previously in captivity (Hudson 1999).


## Acknowledgements

The author gratefully acknowledges the referees for their improvements to the manuscript, and also Val Turner for making the effort to locate several of the references. Skinks were held in captivity under Wildlife License P02006619.


## References


Bennett R (1997) *Reptiles and Frogs of the Australia Capital Territory*. (National Parks Association of the ACT, Woden ACT)

Blomberg SP, Owens IPF and Stuart-Fox D (2001) Ultraviolet reflectance in the small skink *Carlia pectorialis*. *Herpetological Review* **32**(1), 16–17.

Daly G (1993) Unusual behavior of grass skinks (*Lampropholis delicata*). *Herpetofauna* **23**(2), 41.
Fleishman LJ, Loew ER and Leal M (1993) Ultraviolet vision in lizards. *Nature* **365**, 397.
Hudson S (1988) Phalangeal growth rings as a method of ageing scincid lizards, and its application to the study of life history in *Leiolopisma entrecasteauxii* and *L. duperreyi*. (Unpublished BSc (Hons) thesis, LaTrobe University, Melbourne)
Hudson S (1997) Patterns of life history, growth and morphology in south-eastern Australian skinks. (Unpublished PhD thesis, La Trobe University, Melbourne)
Hudson S (1999) Parturition in the Tussock skink, *Pseudemoia pagenstecheri*. *Herpetofauna* **29**(1), 58-59.
Hutchinson MN (1993) Family Scincidae. In *Fauna of Australia - Volume 2A Amphibia & Reptilia*, pp. 261–279. Eds. CJ Glasby, GJB Ross and PL Beesley. (Australian Government Publishing Service, Canberra ACT)
Hutchinson MN and Donnellan SC (1992) Taxonomy and genetic variation in the Australian lizards of the genus *Pseudemoia* (Scincidae: Lygosominae). *Journal of Natural History* **26**, 215–264.
Hutchinson M, Swain R and Driessen M (2001) *Snakes and Lizards of Tasmania*. Fauna of Tasmania Handbook No.9. (Dept. Primary Industries, Water & Environment/ University of Tasmania, Hobart)
Larwill SA (1995) Reptiles and amphibians of the Melbourne area. *The Victorian Naturalist* **112**, 160–171.
Sokal RR and Rohlf FJ (1995) *Biometry* 3 edn. (WH Freeman & Co, New York USA)
Swan G, Shea G and Sadlier R (2004) *A Field Guide to the Reptiles of New South Wales* 2 edn. (Reed/New Holland, Sydney)
Thompson MB and Stewart JR (1994) Egg and clutch size of the viviparous Australian Skink, *Pseudemoia pagenstecheri* and the identity of species with Type III allantoplacentation. *Journal of Herpetology* **28**(4), 519–521.
Torr GA and Shine R (1994) An ethogram for the small scincid lizard *Lampropholis guichenoti*. *Amphibia-Reptilia* **15**, 21–34.
Turner G (1999) Field observations of Gippsland Water dragons *Physignathus lesueurii howitti* sleeping in water. *Herpetofauna* 29(1), 49–51.
Turner GS (2007a) Observations of diurnal activity in the Striped Legless Lizard *Delma impar*. *The Victorian Naturalist* **124**(3), 167–169.
Turner G (2007b) Notes on the habits of three skinks from the Mt Bartle Frere summit, North Queensland. *Herpetofauna* **37**(1), 2–7.
Ward PJ (1978) Evolutionary divergence within the lizard *Leiolopisma entrecasteauxii*. (Unpublished BSc (Hons) thesis, LaTrobe University, Melbourne)

*Received 5 May 2011; accepted 22 September 2011*

## One Hundred and Five Years Ago

Field Naturalists' work: its value to teachers

By J. Hocking, B.A., Principal, Melbourne Continuation School

The work done ... in the field showed that Nature-study is not primarily a class-room subject, nor can it be best taught by means of museum and text-book. Classroom lessons may even be uninteresting and disconnected. One may study form and structure, and gain knowledge, but experts are agreed that Nature-study must begin in the field. Movement and colour are found there, adaptation of structure to environment is learnt by the sea-side or in the tea-tree glade, the relation of the insect to the plant and the balance of Nature can only be studied in the open. Scale insects destroy the honeysuckle, insectivorous birds destroy these in turn. Again, our best thoughts of Nature rest on a realistic back-ground. Some association formed long since, it may be, but ready to spring into being again at the first suggestion. The flower of the gorse is beautiful in itself, but its beauty is intensified when, in the early morning, the hedge of golden blooms is seen winding away to the horizon. The glory of sunrise and of sunset, the grandeur of the mountain range purpled by distance, the profusion of the fern gully, the sparkle and music of the waterfall, the majesty of the gathering thunder-clouds, cannot be brought into the school-room. Out of doors there is access to appropriate conditions. Data must be collected, and a general familiarity with things cultivated. A geological specimen gives no idea of geological time, a dried plant trails with it nothing of the glory of sky and woods, that the larva of the Buprestis is destructive to trees means nothing when told, but to see the larvae at work gives meaning to the statement.

From *The Victorian Naturalist* **XXIII**, p. 234, March 7, 1907